# Overview of the Rocky Flats Site Annual Report of Site Surveillance and Maintenance Activities

# Calendar Year 2008

Rocky Flats Stewardship Council
June 1, 2009

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# Surface Water Monitoring and Operations


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# Pond Operations – CY 2008

- Terminal Pond Discharges
  - None
- Transfers
  - Pond A-3 to A-4
    - March 24 to April 15, 2008; 3.89 MG
- Pond Levels
  - As of January 1, 2009, Ponds A-3, A-4, B-5, and C-2 and the Landfill Pond were holding approximately 14.3 MG (14.4% of capacity)

Recent Pond Levels (May 11, 2009):

- Landfill (21.4%)
- A-3 (29.4%)
- A-4 (46.3%)
- B-5 (56.9%)
- C-2 (29.2%)

# Dam Breach Phase 1

- Breach of Dams A-1, A-2, B-1, B-2, B-3, and B-4 completed in March 2009

Dam A-1:
October 8, 2008

Dam A-1: Notch and Stoplog Structure
April 23, 2009

Dam A-1:
January 8, 2009

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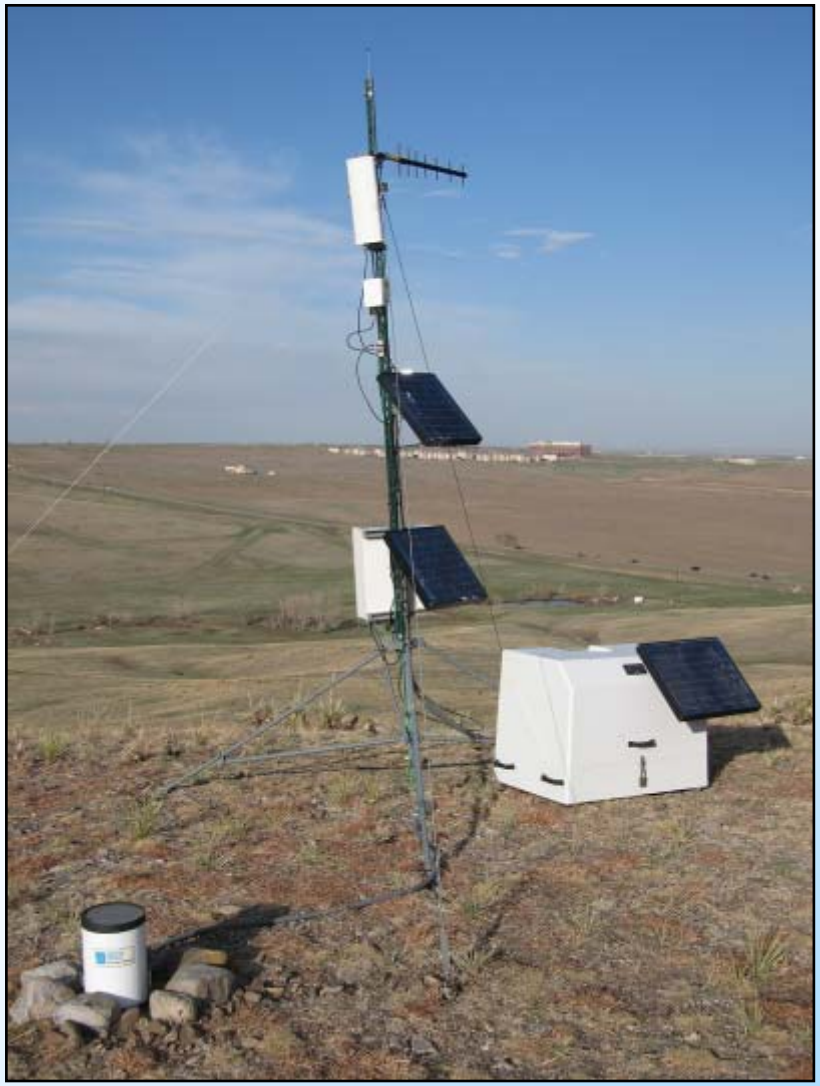
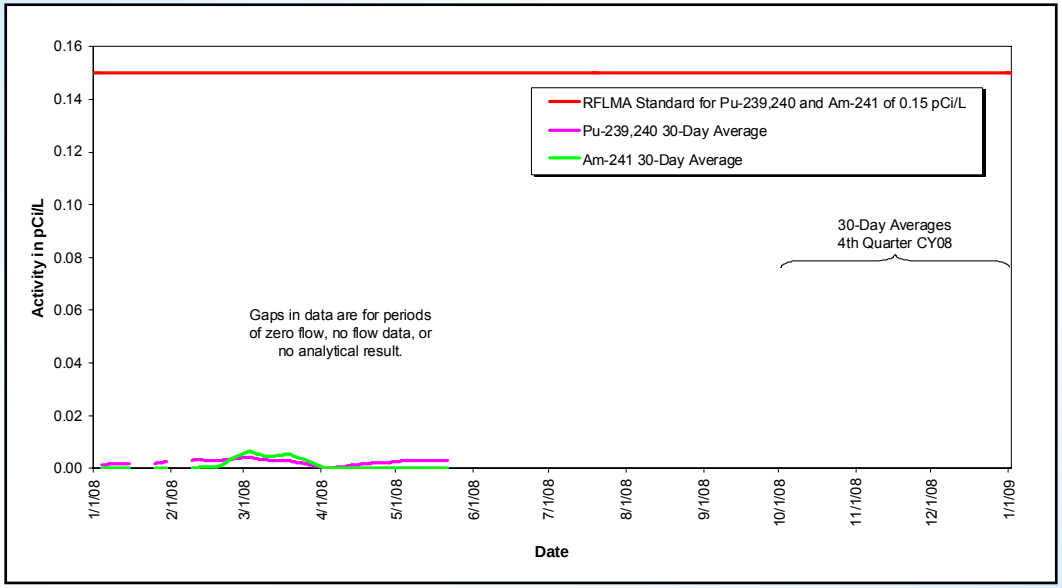
# Hydrologic Data – CY 2008

- Precipitation
  - Total precipitation was 9.4 inches
  - This was 76% of the average of CY 1993–2007
- Flow rates (percentage of CY 1997–2007 average)
  - GS01 (9%)
  - GS03 (no flow)
  - GS10 (12%)
  - SW027 (no flow)
  - SW093 (10%)

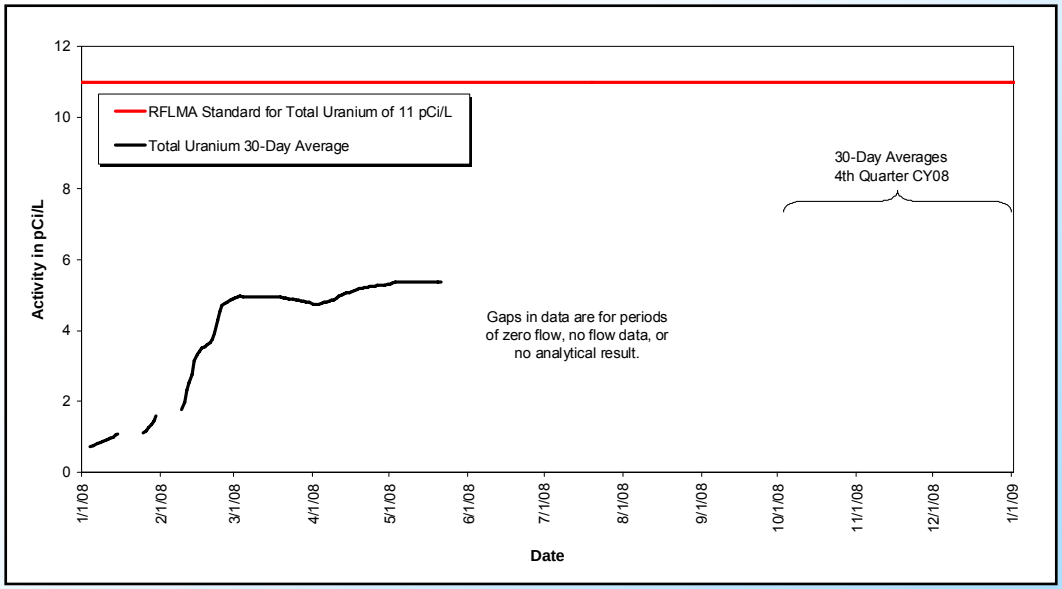


# POC GS01

- Plutonium and Americium




- Total Uranium

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# POC GS03

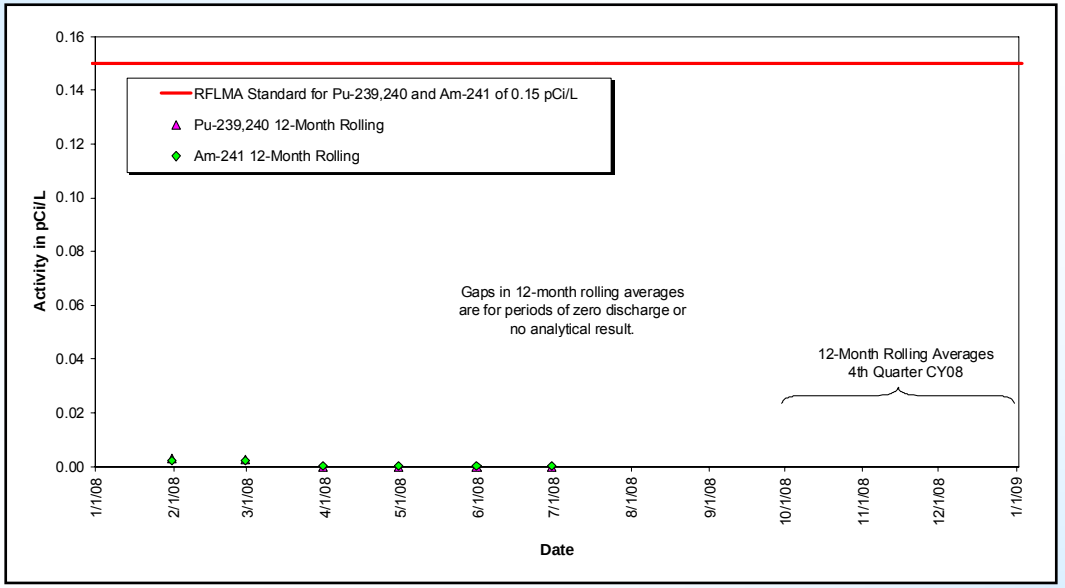
- Plutonium and Americium

No flow at GS03 during CY 2008.

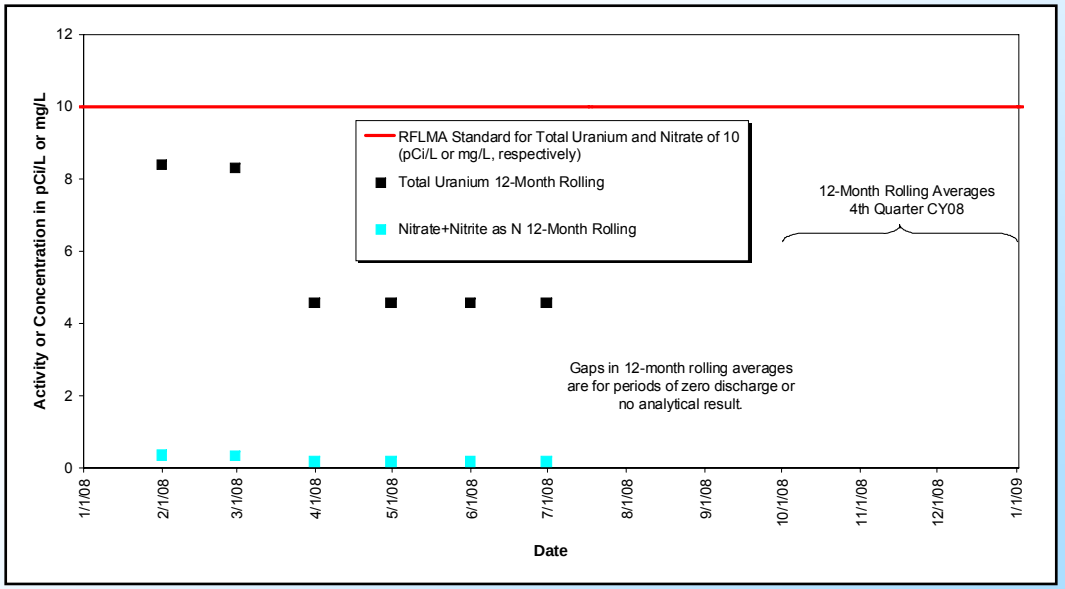
- Total Uranium and Nitrate + Nitrite as Nitrogen

# POC GS08

- Plutonium and Americium

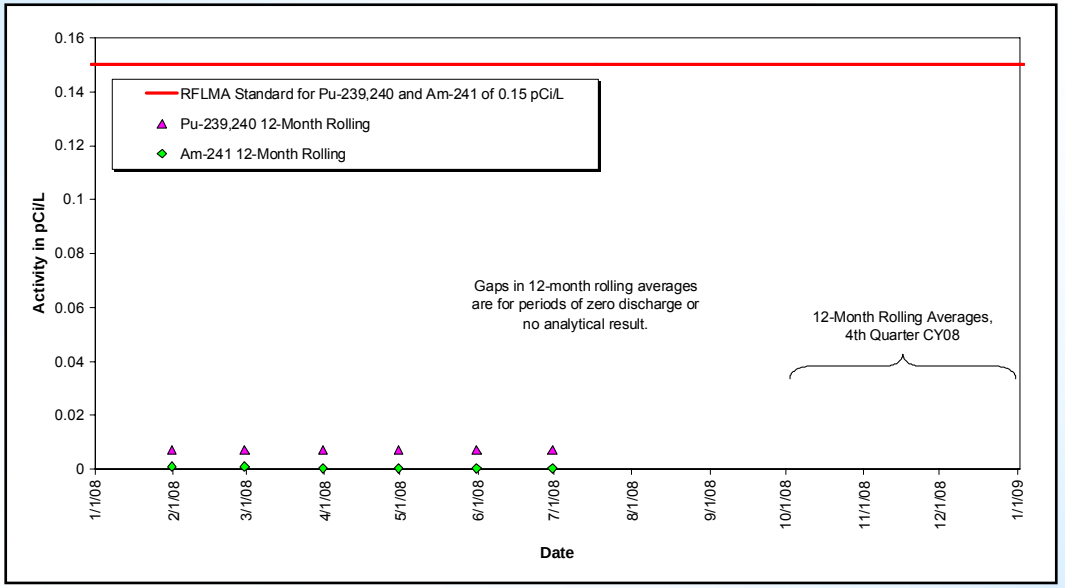



- Total Uranium and Nitrate + Nitrite as Nitrogen

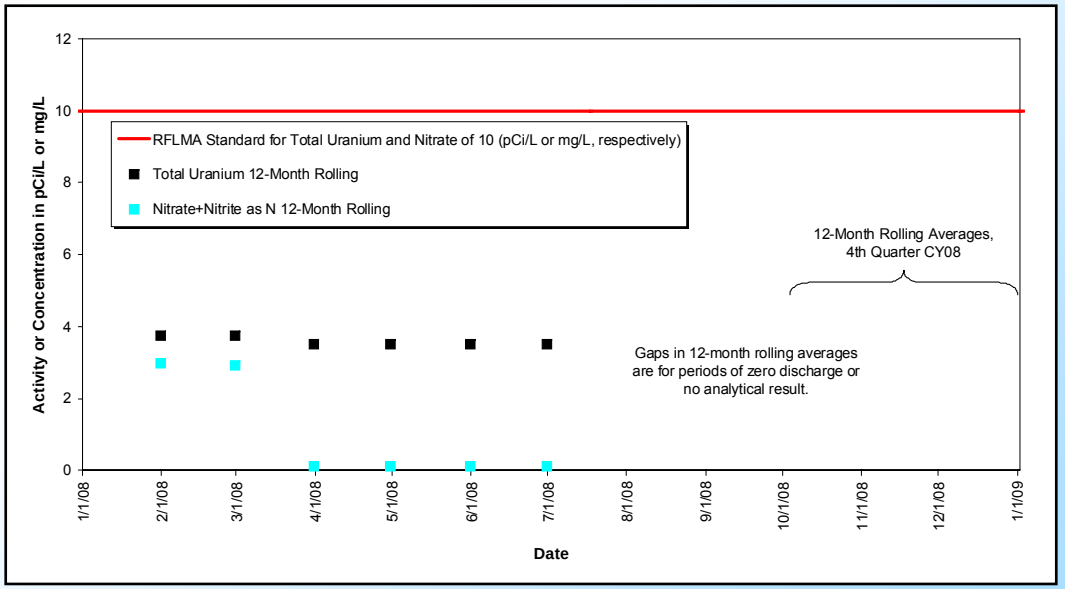


# POC GS11

- Plutonium and Americium




- Total Uranium and Nitrate + Nitrite as Nitrogen



# POC GS31

- Plutonium and Americium

No Pond C-2 discharge during the last 12 months.

- Total Uranium

# Point of Evaluation Monitoring – CY 2008

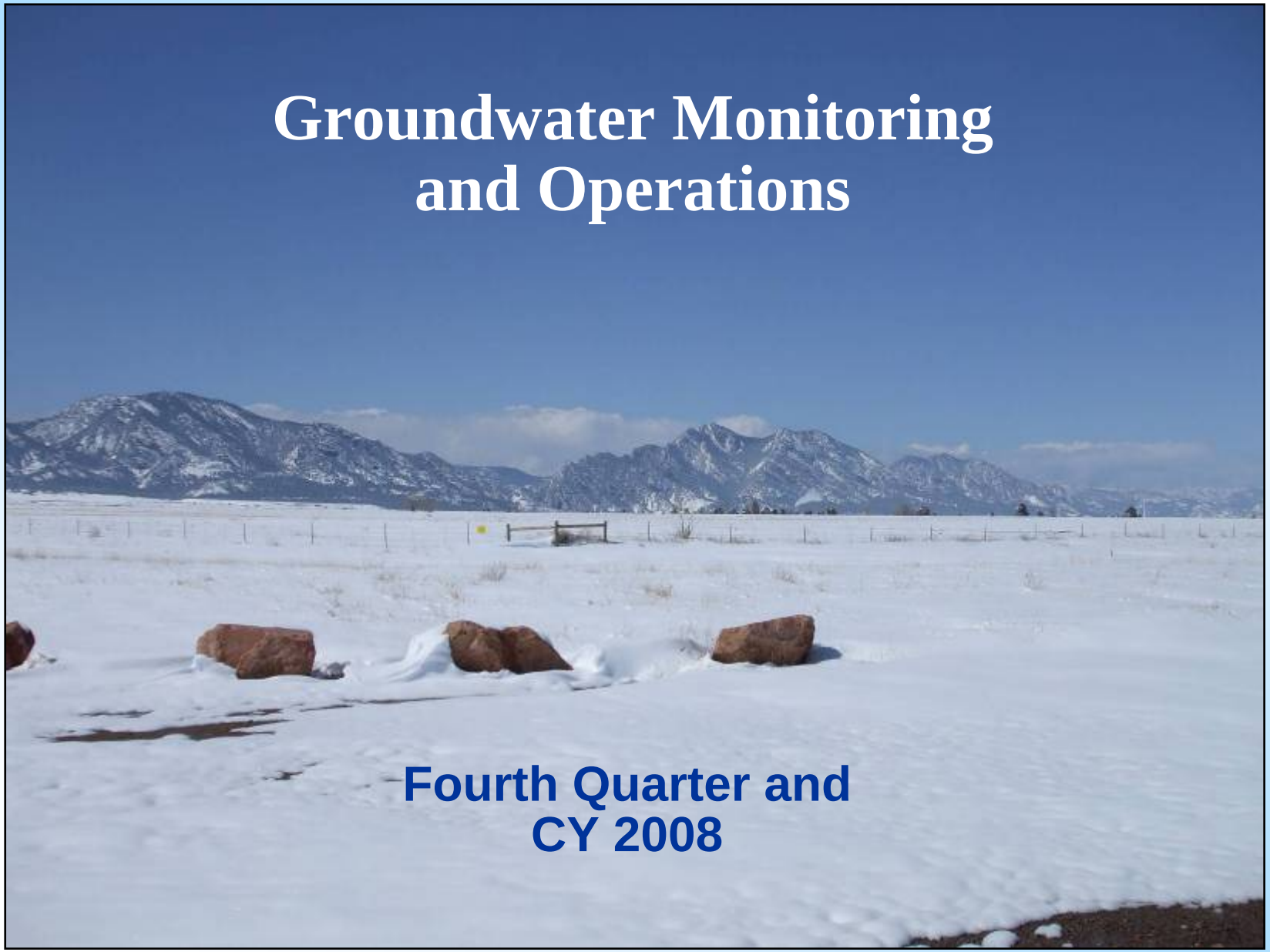
- Water quality at all Points of Evaluation, except GS10, was below applicable standards
  - Reportable values for total uranium at GS10 continue to be observed and are probably caused by groundwater contributions of naturally occurring uranium to South Walnut Creek

# Performance Monitoring – CY 2008 Original and Present Landfills

- **OLF:** Surface water quality results during CY 2008 triggered monthly sampling for selenium
  - Selenium was not detected in three consecutive monthly samples; monthly sampling was discontinued
- **PLF:** Surface water quality results triggered monthly sampling for selenium, silver, and vinyl chloride
  - No analytes were detected in three consecutive monthly samples; monthly sampling was discontinued

# Questions?

# Groundwater Monitoring and Operations



## Fourth Quarter and CY 2008

# RFLMA Monitoring, 4th Quarter 2008

- All Area of Concern (AOC), Sentinel, and Resource Conservation and Recovery Act (RCRA) wells were monitored
- Treatment system locations were monitored
- Results are included and evaluated in the 2008 Annual Report

# Non-RFLMA Monitoring – 4th Quarter 2008

- Additional samples were collected at and around the Solar Ponds Plume Treatment System (SPPTS)
  - Additional characterization of waters collected in the ITSS
  - Continue to assess the effects of the Phase I upgrades

# Selected Highlights from 2008

- All groundwater treatment systems continue to remove contaminants from the groundwater
- Mound Site Plume Treatment System (MSPTS) treated approximately 358,000 gallons
  - Continues trend observed since 2005, wherein volume treated is significantly greater than that treated before 2005
  - Contaminant concentrations in system influent continue to reflect presence of Oil Burn Pit (OBP) #2-impacted groundwater
  - Indicates the diversion installed in 2005 to route OBP #2 water to the MSPTS continues to be effective
  - Effluent water quality is generally consistent with that of previous years

# Selected Highlights from 2008 (cont.)

- MSPTS volume estimates

| Calendar Year | Annual Estimates of Volume Treated (gallons) | Estimated Cumulative Volume Treated (gallons) |
|---|---|---|
| 2000 | 258,000 | 660,000 |
| 2001 | 119,000 | 780,300 |
| 2002 | 53,000 | 833,000 |
| 2003 | 82,000 | 915,000 |
| 2004 | 86,000 | 1,001,000 |
| 2005 | 506,000 | 1,507,000 |
| 2006 | 430,000 | 1,937,000 |
| 2007 | 326,000 | 2,263,000 |
| 2008 | 358,000 | 2,621,000 |

# Selected Highlights from 2008 (cont.)

- East Trenches Plume Treatment System (ETPTS) treated approximately 629,000 gallons
  - Continues trend observed since 2006, wherein volume treated is significantly lower than that treated before 2006
  - Contaminant concentrations in system influent are generally consistent with previous years
  - Effluent water quality is generally consistent with that of previous years
  - Slight increases in effluent concentrations of some contaminants (e.g., PCB, TCE), and media clogging, will lead to media replacement maintenance activity in 2009

# Selected Highlights from 2008 (cont.)

- ETPTS volume estimates

| Calendar Year | Annual Estimates of Volume Treated (gallons) | Estimated Cumulative Volume Treated (gallons) |
|---|---|---|
| 2000 | 1,633,000 | 2,800,000 |
| 2001 | 1,900,000 | 4,700,000 |
| 2002 | ≤1,000,000 | 5,700,000 |
| 2003 | 2,100,000 | 7,800,000 |
| 2004 | 1,500,000 | 9,300,000 |
| 2005 | 1,800,000 | 11,100,000 |
| 2006 | 675,000 | 11,775,000 |
| 2007 | 951,000 | 12,726,000 |
| 2008 | 629,000 | 13,355,000 |

# Selected Highlights from 2008 (cont.)

- SPPTS treated approximately 280,000 gallons
  - Generally consistent with previous years, but does reflect a slight increase and is the highest volume treated since 2003
  - Reflects additional influent from Phase I upgrades, completed in October
  - Contaminant concentrations in system influent were generally consistent with previous years until Phase I completed
  - Following Phase I, concentrations of nitrate up 2 to 3 times, uranium up less
  - Effluent water quality was acceptable prior to Phase I, then additional flow and contaminant load challenged media
  - Phases II and III will improve treatment and inform Phase IV

# Selected Highlights from 2008 (cont.)

- SPPTS volume estimates

| Calendar Year | Annual Estimates of Volume Treated (gallons) | Estimated Cumulative Volume Treated (gallons) |
|---|---|---|
| 2000* | 64,000 | 64,000 |
| 2001* | 424,000 | 452,700 |
| 2002 | 5,600** | 458,000 |
| 2003 | 340,000 | 797,000 |
| 2004 | 230,000 | 1,027,000 |
| 2005 | 140,000 | 1,167,000 |
| 2006 | 251,000 | 1,418,000 |
| 2007 | 244,000 | 1,662,000 |
| 2008 | 280,000 | 1,942,000 |

*Annual and cumulative volume estimates for 2000 and 2001 are suspect, as a sum of the volumes presented in each of the quarterly reports for 2000 and statements regarding the volume for 2001 disagree by approximately 35,000 gallons.

**Most of this volume was from the former Modular Storage Tanks (K-H 2003).

# Selected Highlights from 2008 (cont.)

- Trending calculations performed per RFLMA
  - Seasonal-Kendall (S-K) trending
    - Sentinel wells
    - RCRA wells (data only adequate for trending at upgradient PLF)
  - Mann-Kendall (M-K) trending
    - Evaluation wells (no seasonal component)
- Additional trending performed outside of RFLMA
  - S-K
    - Select AOC wells, analytes (uranium, nitrate at B206989; uranium at 10594)
  - M-K
    - Select boundary well analytes (uranium)

# Selected Highlights from 2008 (cont.)

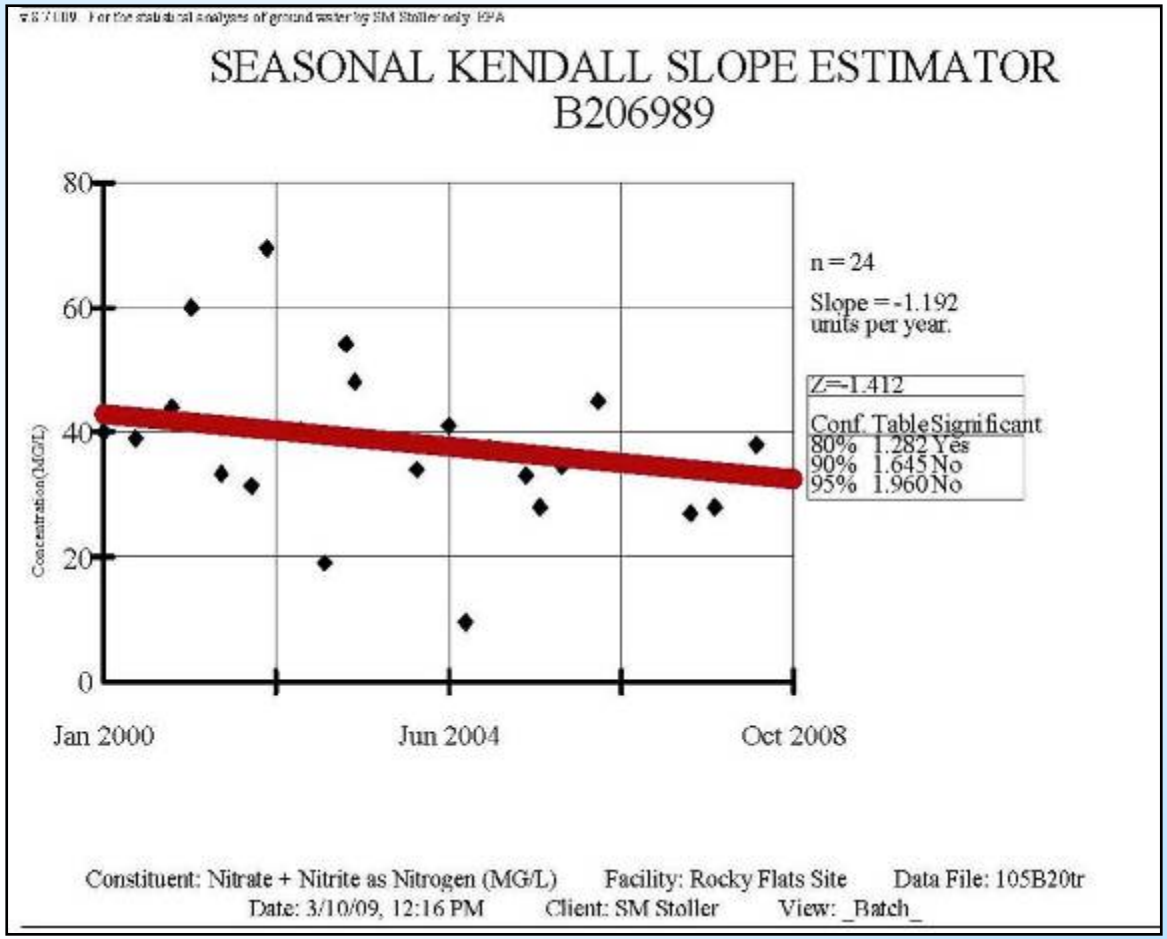
- Of all statistically significant (at the 95 percent level of confidence) trends identified in statistical trending evaluations for the 2008 Annual Report, 54 are decreasing and 44 are increasing
- See 2008 Annual Report text, tables, figures, and Appendix B for well- and chemical-specific details

# Selected Highlights from 2008 (cont.)

- Sentinel well monitoring on hillside south of B991
  - Original well, 45605, abandoned in late 2007
  - Hillside (slump) regraded
  - Replacement well, 45608, installed in early 2008
  - Replacement well 45608 is artesian
- AOC well B206989 (east of Landfill Pond dam)
  - Entered reportable condition for nitrate in 2007
  - Incorporating all 2008 data indicates decreasing trend, 80 percent significance
  - Consulting with Colorado Department of Public Health and Environment (CDPHE) on path forward

# Selected Highlights from 2008 (cont.)

- S-K trend plot for nitrate in samples from B206989

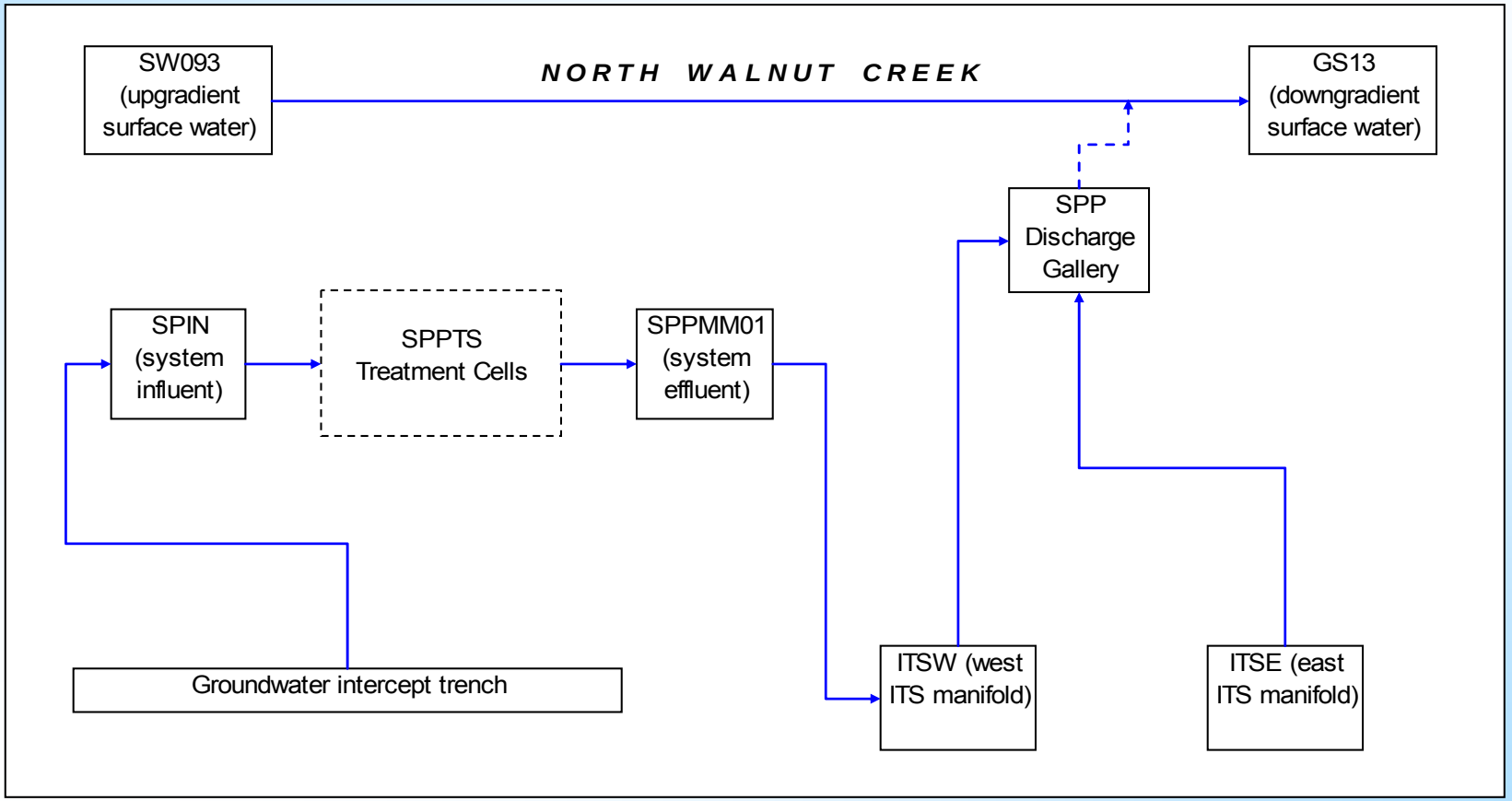


# Selected Highlights from 2008 (cont.)

- SPPTS Phase I installation completed
- Intent: Capture additional contaminated groundwater
  - Installed collection system and sump near former ITPH
  - Installed line routing water from sump to SPPTS treatment cells
  - Installed new discharge line
  - Added monitoring capabilities
  - All solar powered

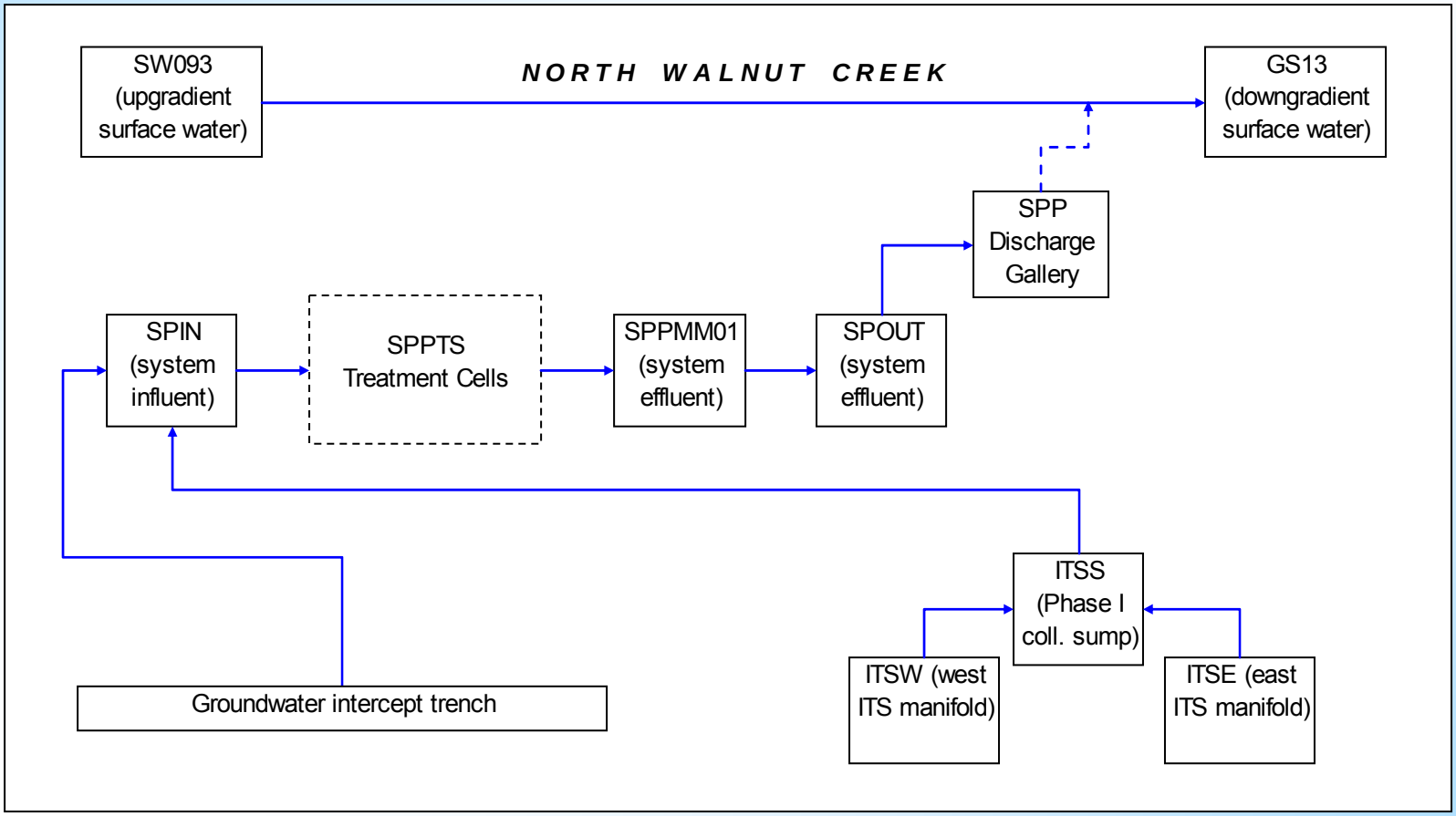
# Selected Highlights from 2008 (cont.)

## Before



# Selected Highlights from 2008 (cont.)

## After



# Selected Highlights from 2008 (cont.)

- Results of Phase I upgrades to SPPTS, as previously reported
  - Flow volume increased
  - Concentrations of nitrate and uranium increased
  - Media challenged
  - Concentrations of nitrate and uranium in system effluent increased

  Net effect: Although concentrations in system effluent increased, concentrations of nitrate and uranium in water at the Discharge Gallery (DG) have ***decreased***

# Selected Highlights from 2008 (cont.)

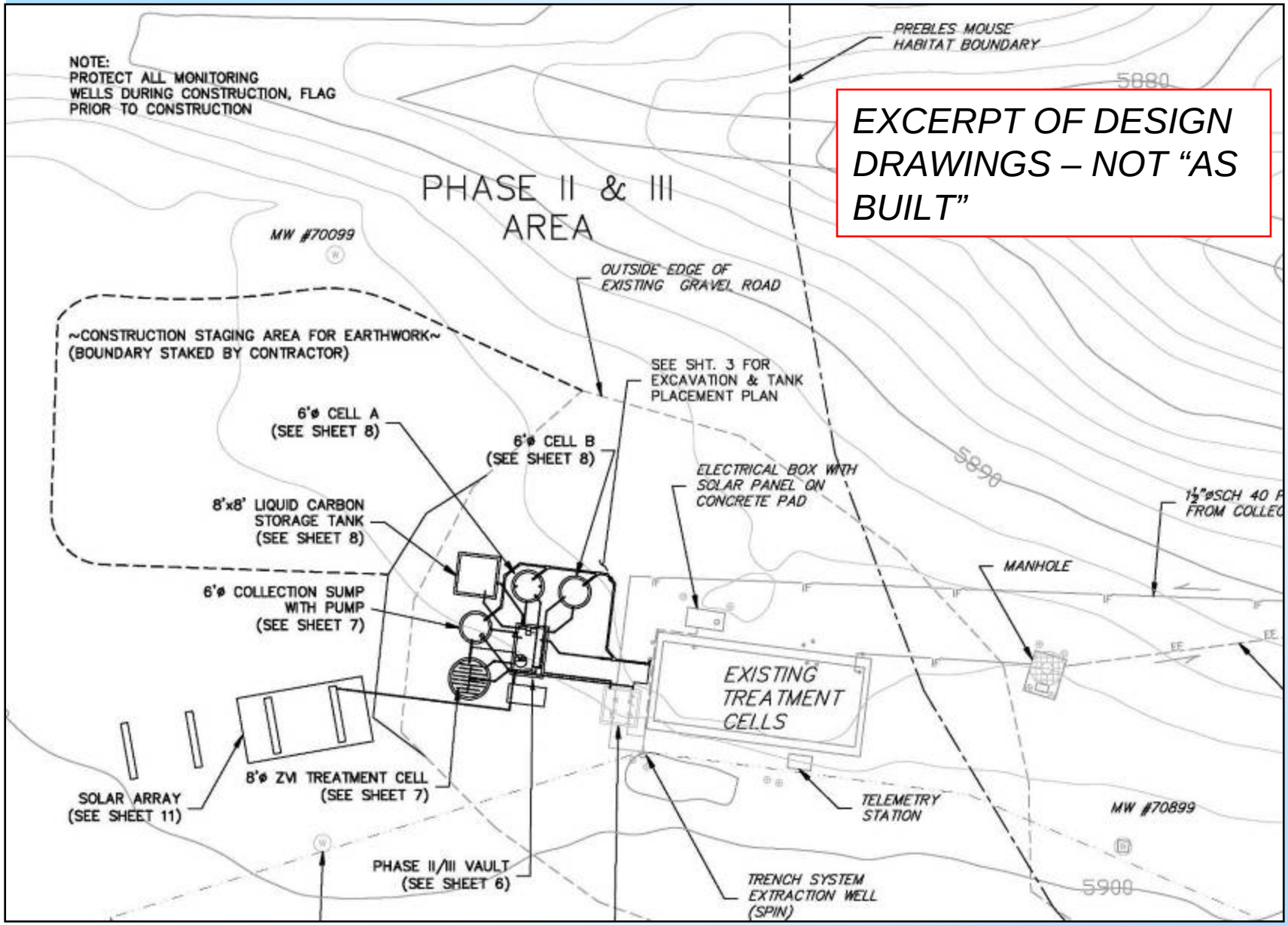
- Effects of SPPTS Phase I on water quality at the DG

| Analyte | Date Range | Average Concentration | Standard Deviation | Median Concentration |
|---|---|---|---|---|
| Nitrate+nitrite as nitrogen (mg/L) | 1/1/2000-10/13/2005 (before closure) | 260 | 123 | 233 |
| | 10/14/2005-10/21/2008 (after closure) | 450 | 123 | 425 |
| | 10/22/2008-12/31/2008 (after Phase I) | **335** | 64 | 335* |
| Total U (µg/L) | 1/1/2000-10/13/2005 (before closure) | 53 | 45 | 43 |
| | 10/14/2005-10/21/2008 (after closure) | 60 | 15 | 56 |
| | 10/22/2008-12/31/2008 (after Phase I) | **25** | 2 | 25* |

*Two sets of samples were collected in the period from 10/22/08 through 12/31/08, and therefore the average and median are identical.

# SPPTS Update

- Summary of path forward
  - **Phase I:** Collect additional contaminated groundwater, route it through treatment cells (completed)
  - **Phase II:** Install uranium treatment cell as first treatment step (construction grouped with that of Phase III, recently completed)
  - **Phase III:** Conduct pilot-scale study to identify preferred nitrate treatment media (construction grouped with that of Phase II, recently completed; studies underway)
  - **Phase IV:** Use results from Phase III together with concentrations and flows measured since completion of Phase I to design and construct full-scale nitrate treatment cell




*EXCERPT OF DESIGN DRAWINGS – NOT "AS BUILT"*

# SPPTS Update (cont.)

Phase II and III components during construction

# SPPTS Update (cont.)

- Phase II media
  - Analogous to media in original Cell 2 (zero-valent iron [ZVI] with pea gravel)
  - Incorporates an innovative approach to extend the life of the ZVI by reducing clogging
    - Sodium citrate added to influent, chelating dissolved iron so it does not form precipitates
    - Bench-scale studies have shown this to be extremely effective
- Phase III media
  - Cell A: Inert plastic media, fed a liquid carbon byproduct from the biofuels industry
  - Cell B: Reactive organic media (“corn stover”)

# SPPTS Update (cont.)

- Phase II and Phase III components, as well as proximal North Walnut Creek, will be heavily monitored over the next several months to assess their relative effects on water quality

# Questions?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# Annual Site (Central OU) Inspection – April 14, 2008

- Inspection and monitoring for evidence of significant erosion
  - Conduct visual observation for precursors of significant erosion
  - Evaluate proximity of any significant erosion to subsurface features
- Inspect effectiveness of institutional controls (ICs)
  - Determine effectiveness by any evidence of violation of ICs and determine whether required signs are in place
  - Verify that Environmental Covenant is in Administrative Record and on file with Jefferson County (verified April 8, 2008)
- Evidence of any adverse biological conditions observed during inspection

# Annual Inspection (cont.)

- Central OU divided into five areas:
  - A – Former 300 and 400 Areas
  - B – Former 700 and 991 Areas
  - C – Former 800 Area
  - D – Former 903 Pad and East Trenches Area
  - E – Former Ash Pits Area
- Landfills, treatment systems, and water monitoring stations inspected during the year on a routine basis
- Team walked down surface of each area (A–E) to observe conditions

# Annual Inspection (cont.)

- No significant erosion noted – minor holes, small animal evidence, and depressions identified
  - Very limited aerial extent – filled in
  - Debris and trash collected or flagged for pick up
- No adverse biological conditions noted
- No evidence of IC violations
- Signs in place

# Update on Water Quality Control Commission (WQCC) Rulemaking

- Petition to adopt the statewide basic uranium standard (MCL 30 μg/L [approximately 20 pCi/L]) – hearing: January 12, 2009
  - WQCC recognized that changed conditions warranted revision
  - Water Quality Control Division (WQCD) said that a mistake was made in promulgating uranium's statewide standard in 2005
    - The range should be from 16.8 to 30 μg/L ("hyphenated standard")
    - Many analytes have the hyphenated standard
    - The statewide uranium standard will be clarified
  - The higher number applies as the end-of-pipe limit for discharge permits
  - The lower number is a health-based goal value derived using WQCC methodology per Policy 96-2
    - $10^{-6}$ incremental lifetime cancer risk
    - 2 liters drunk per day over a lifetime

# Update on WQCC Rulemaking (cont.)

- WQCC revised the site-specific uranium standard to the 16.8 μg/L (approximately 11.5 pCi/L) health-based standard
- A higher ambient-based standard may be addressed in the future, based on data and regulatory considerations, including practicality/feasibility
- Gross alpha and gross beta standards were removed; specific radionuclides (uranium, plutonium, and americium) are being monitored

# Update on WQCC Rulemaking (cont.)

- Expiring temporary modifications (TMs) annual review – hearing: December 2008
  - Current Rocky Flats TMs (six volatile organic compounds [VOCs], nitrate/nitrite) and the expiration date (December 31, 2009) were retained
- Triennial review – South Platte River Basin
  - Issues formulation hearing: November 10, 2008; rulemaking hearing: June 2009
  - Potential Rocky Flats issues:
    - Rocky Flats TMs expire on December 31, 2009
    - The SPPTS upgrade should reduce nitrate loading to North Walnut Creek, but it may not meet 10 μg/L by December 31, 2009
    - New statewide basic standard for arsenic (0.02–10 μg/L) below site-specific standard (50 μg/L)

# Update on WQCC Rulemaking (cont.)

- WQCD key proposed revisions
  - Revise site-specific arsenic standard from 50 µg/L to new statewide basic water supply standard of 0.02 to 10 µg/L
    - Post-closure arsenic results generally below 10 µg/L
    - Arsenic analysis under RFLMA
      - Quarterly Woman Creek GS05 (upstream OLF and Central OU) and GS59 (downstream OLF)
      - Quarterly Present Landfill treatment system effluent (and Landfill Pond if triggered)
    - Reviewed post-closure monitoring data with WQCD staff
      - Total recoverable standards are assessed based on the 50th percentile
      - The 50th percentiles of the data do not exceed 10 µg/L
      - Arsenic is in attainment based upon the data presented

# Update on WQCC Rulemaking (cont.)

- WQCD key proposed revisions (cont.)
  - Change recreational class from non-contact to contact (segment 4a) and potential contact (segments 4b and 5) – WQCD rationale
    - Potential public access after closure now allowing actual or potential recreational contact (e.g., swimming)
    - WQCD "understanding" now open to public
    - RFCA "requires" water quality suitable for all purposes
  - Results in lower E.Coli standard
  - May allow for possible future adoption of other site-specific standards to protect classification
- Rocky Flats submitted response to WQCC regarding post-closure public access restrictions. Discussing with WQCD.

# Update on WQCC Rulemaking (cont.)

- Other key issues
  - TMs for segment 5 will expire December 31, 2009
    - Six VOCs – Underlying standards (or practical quantitation levels if higher than standard) met at southwest performance monitoring points
    - Nitrate in North Walnut Creek – Underlying standard (10 µg/L) currently not met at GS13
    - SPPTS Phase III upgrade (pilot scale) will provide data for Phase IV, with goal to meet 10 µg/L
  - Rocky Flats not requesting any change to TM expiration date

# 2008 Ecological Monitoring Summary

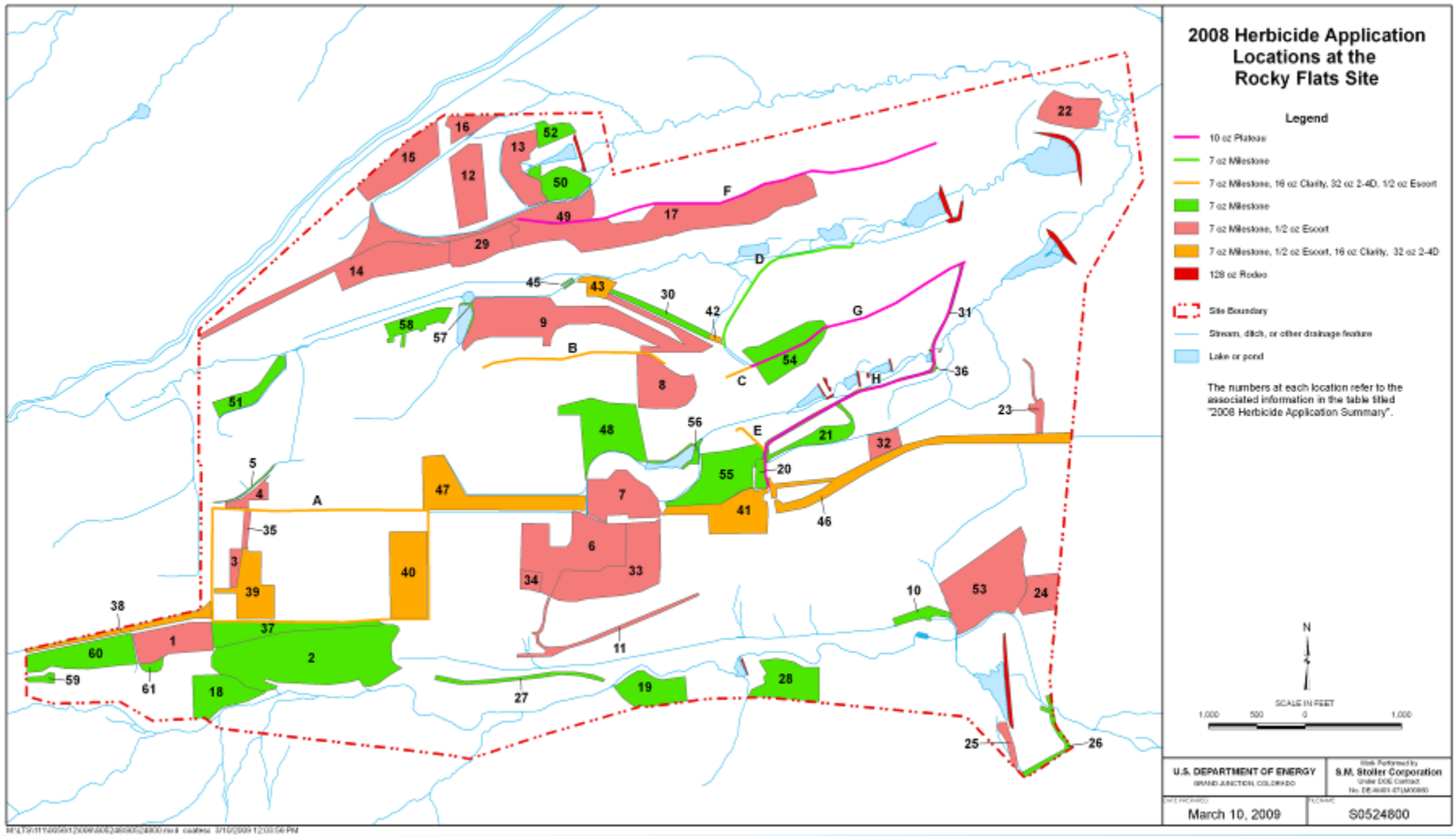
# Project Assistance

- Project support for ecological issues was provided for
  - OLF West Channel Project
  - 2008 Roads Projects
  - Dam Breach Project
  - Annual Dam Mowing and Riprap Spraying Project
  - Solar Ponds Sump Installation and Phase II/III Project
  - Trash Removal (large tank) in Central OU

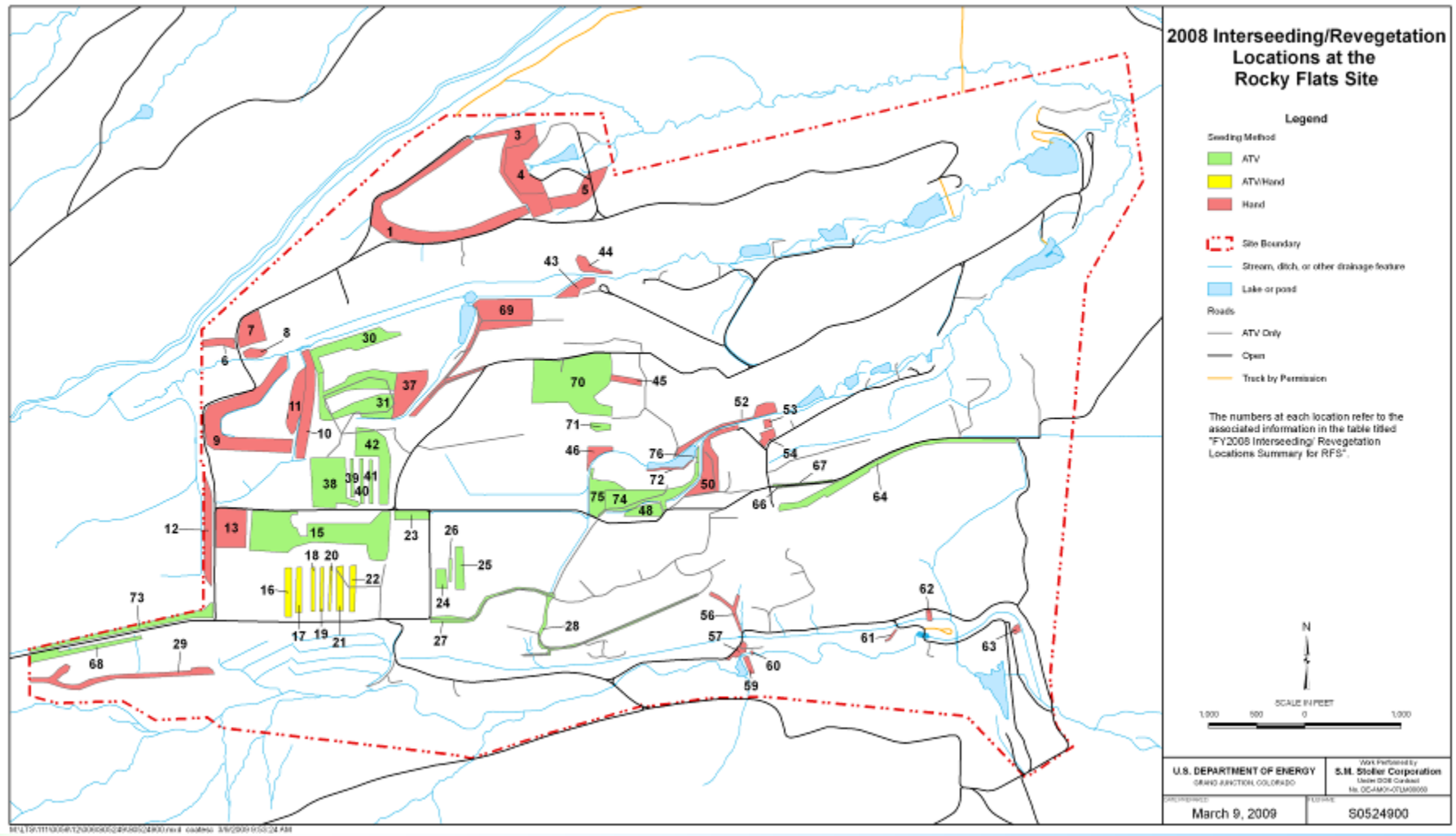
# Ecological Monitoring

- OLF and PLF vegetation surveys
- Monthly weed surveys in the mitigation wetlands
- Revegetation monitoring
- Weed monitoring/mapping
- Preble's mouse mitigation monitoring
- Wetland mitigation monitoring

# Weed Control



# Revegetation Activities

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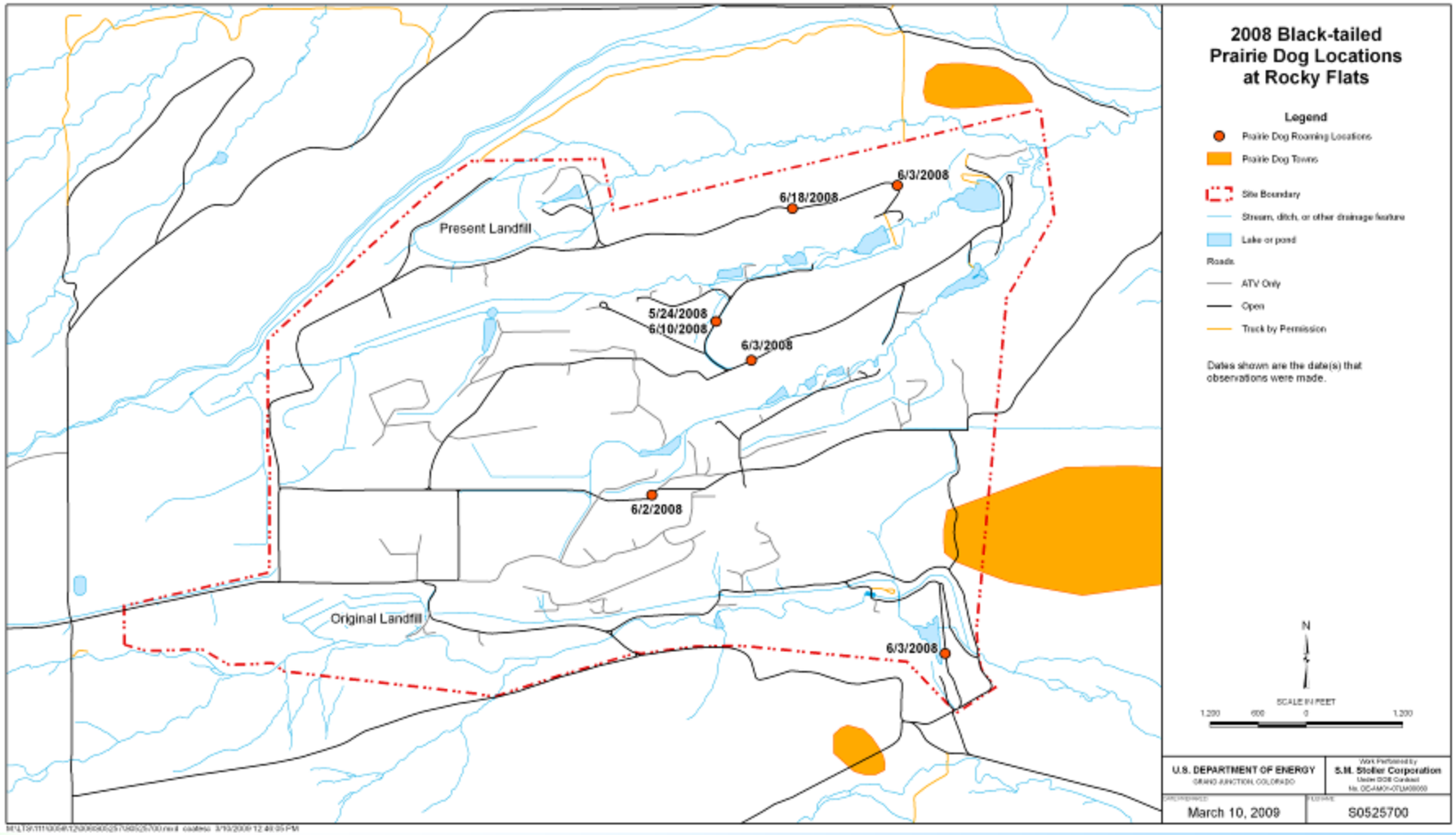
# Wildlife Monitoring



# Questions?

# Site Operations

# Site Operations

## OLF – Inspections

- Twelve monthly inspections were performed in 2008
- Fourth quarter inspections were completed on October 29, November 25, and December 29, 2008

# Site Operations (cont.)

**OLF Seep #7 Drain Extension**

- CDPHE approved the design on September 2, 2008
- The project was started on September 3, 2008, and completed on September 10, 2008
- The Seep #7 drain was extended and tied in with the existing drain

# Site Operations (cont.)

## OLF Seep #7 Drain Extension

# Site Operations (cont.)

## OLF Berm Regrade Project

- Rocky Flats Alluvium was added to the tops of berms to obtain minimum berm height requirements
- Troughs of berms, where ponding was occurring, were regraded
- The project was started on September 16, 2008, and finished on September 24, 2008

# Site Operations (cont.)

## West Perimeter Channel Regrade Project

- Area between western ends of Berms 1 and 3 was regraded to improve stability
- Existing gravel drain between Diversion Berms 1 and 2 was tied in to an extension of the gravel drain to the southern end of the perimeter channel
- The Diversion Berm 3 gravel drain was also tied in to the extension of the gravel drain to the southern end of the perimeter channel
- Project was completed in November 2008

# Site Operations (cont.)

## West Perimeter Channel Regrade Project


# Site Operations (cont.)

## OLF West Perimeter Channel Regrade


# Site Operations (cont.)

## PLF – Inspections and Surveys

- Four quarterly inspections completed in 2008
- The fourth quarter inspection was completed on November 25, 2008
- The settlement monument surveys were completed on June 21, 2008

# Questions?